AKBY®

SN 型三螺杆泵
使用维护说明书

operation specifications
of Three Screw Pump Type SN

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1、概述

1.1 用于低压范围的 SN 系列和用于中压范围的 SM 系列螺杆泵，是具有良好吸入能力的容积式泵，适用于低粘润滑性差液体的输送。工作温度≤150℃，加热泵体适用于高粘、流动性差液体的输送，绝对禁止输送水及其相似介质。

1.2 基于多年的实践经验，螺杆泵使用精选材料制造，生产质量达到了高水平。只要安装合理，使用正确，可保证泵的正常运转和使用寿命。投入运行时如出现故障和差错，我方建议整个系统按故障检查表逐项检查。

首先检查现有操作条件是否与铭牌上的设计数据相符合。在第 6 页上的故障检查表将提供您发现和排除故障的方法。

2、结构

2.1 泵有三根螺杆，一根主杆（12）两根从杆（13）。螺杆在衬套内以相当小的间隙旋转。泵体内装衬套（2），一端为前盖（3），另一端为后盖（4）。机械密封（83）内装，轴承

1. General

1.1 Screw pump series SN for the low-pressure and SM for the medium-pressure range are rotary positive displacement pumps of good suction capacity for the delivery of low viscosity and bad lubricating media. The working temperature is ≤150℃. The heating pump casing is suited for high viscosity and bad floating media. The pumps refuse to handle water or similar liquids.

1.2 Our screw pumps, based on experience of many years standing, are made of selected material with the production quality being at a high level. Properly installed, they guarantee operating reliability and longevity. In case of faults or failures during the putting into operation, we recommend to have the whole plant included in the trouble shooting. First, it must be checked whether the existing operating conditions correspond to the layout data engraved on the instruction plate. The troubleshooting plan on page 8 shall be a guide to the finding and elimination of the troubles.

2. Construction

2.1 The pump has 3 spindles, a start driving spindle (12) and two start idler spindles (13). These run in the insert with fairly close running clearances. The pump casing contains the insert (2) and is fitted with a drive end cover (3) and a blank cover (4) at the non-drive end. The mechanical sealing is fitted inside. The bearing is fitted outside. The hot

（34）外装。加热泵体可用热蒸汽或其它热载体对介质加热。

2.2 SNS、SMS 系列立式泵的后盖（4）为圆盘底脚。

2.3 轴承箱内的滚动轴承（34）固定主杆的位置，并承受立式泵三根螺杆的重量。

2.4 如果泵装安全阀，阀装在泵体上。

2.5 SNE、SME 系列转子组件泵一般不提供泵体，可安装在下列地方，如：泵站、潜水体、液压罐、液压缸等。

3、原理

3.1 旋转螺杆（12、13）则在齿型间形成了沿轴向匀速移动的密封腔，它们就如一系列永远向一个方向运动的活塞，将液体由进口平稳地输送到出口。作用在齿面上的轴向力由平衡活塞（A、B）平衡。因此轴承（34）仅承受剩余轴向力。

3.2 从杆是液压驱动的，仅传递由液体摩擦引起的扭矩，起密封作用。

3.3 密封腔（D）通过衬套上的

pump casing is heated by the hot steam and other hot carrier to heat the media.

2.2 On the vertical pedestal mounting pumps SNS and SMS the nondrive cover is made as a circular foot.

2.3 A ball bearing (34) in the drive end cover locates the driving spindle and supports the weight of the three spindles.

2.4 If the pump is equipped with a pressure relief valve, the valve is mounted on the pump casing.

2.5 The cartridge unit pump SNE, SME respectively is supplied without a pump casing . It may be installed to suit the conditions into pump stands, sub bed bodies, hydraulic vessels, cylinder housings etc.

3. Method of operation

3.1 On turning the contra-rotating spindles (12, 13), the chambers formed and sealed by the tooth flanks move axially and completely uniformly. They thereby act as a series of pistons always moving in the same direction. As a result the liquid is smoothly conveyed from suction chamber to the pump discharge chamber. The axial thrust acting on the pressure side on the faces of the tooth flanks equalized by suitable sizing of the balancing piston (A.B.). Thus the ball bearing (34) is relieved from the axial hydraulic thrust.

3.2 The driven spindles are driven hydraulically. The tooth flanks merely transmit the turning moment resulting from the fluid friction.

3.3 The sealing chamber (D) is communicated with the suction chamber

回油管与吸入腔相通，压力受吸入腔支配。

4、维护和控制

4.1 E 型泵是由机械密封密封的，润滑由所输送的液体提供。机械密封不需要维护，如泵的泄漏过大则需要换机械密封。E 型泵的轴承是外装的，轴承采用润滑脂润滑。润滑脂由油杯定期用油枪加入。正常使用条件下，轴承的设计寿命约为 24000 小时。

4.2 对于间断性操作、高温、低粘、润滑性差的介质及相似介质，泵的实际使用寿命可能会缩短。因此我方建议定期检查泵的噪音和轴承处的温度。

4.3 如果啪啪声或隆隆声代替了泵正常工作时的嗡嗡声，或轴承处的温度急剧升高，这说明轴承出了故障应尽快更换轴承。

5、泵的安装

5.1 所有的管路、闸阀、阀等都应在安装前冲洗干净，否则安装中残留物：如：焊渣、钢粒、螺母、螺丝等将会损坏泵的内部。

through backoil pipe. The pressure is controlled by suction chamber.

4. The maintenance and control

4.1 The E type pump is sealed by the mechanical sealing. The sealing is lubricated by the transferred liquid. So the mechanical sealing doesn't need to maintain. If the leakage of the pump is too large, you must change the mechanical sealing. The bearing of the E type pump is external. The bearing of the E type pump is external. The bearing is lubricated by grease. The grease must be added with an oil gun. The design lifetime is 24000 hours in normal operation condition.

4.2 Owing to intermittent operation high temperature, low viscosity, badly lubricating media or the like, the actual service life maybe shortened. Therefore, we recommend to check, at regular intervals, the background noise and temperature within the bearing area.

4.3 If crackling or rumbling noises of the normal buzzing sound, or excessive increase in temperature are noticed, this indicates an imminent defect of the bearing and the ball bearing should be exchanged as soon as possible.

5. Erection of the pump Unit

5.1 All the pipe lines, gate valves, valves etc. should definitely be rinsed through or cleaned before the installation of the pump. Installation residues such as welding beads, steel particles, crews, nuts etc can severely damage the pump internals.

5.2 泵底脚必须平稳的安放在地基上，地脚螺钉必须拧紧。

5.3 联轴器的同轴度，直线度必须用钢直尺、塞尺从四个方向上检查。

5.4 装配后应能用手轻松的转动主杆。

5.5 吸入和排出管道必须与泵体法兰联接正确，绝对不能为使吸入和排出管道就位而用螺栓错动泵体，同时不要忘记放垫片。

5.6 若可能，泵吸入、排出管道的公称尺寸应保证吸入管道流速不大于 1m/s，排出管道流速不大于 3 m/s。

5.7 联接压力表和真空表。

6、启动

6.1 泵严禁干运转。初次启动前应在泵体内注满要输送的液体，这可为泵启动时提供必要的液体密封。

6.2 泵体的最高处有供注油用的螺塞（46）。

6.3 点动，检查电动机的旋转方向。

6.4 启动前打开所有进、出管道上的阀。

5.2 The base plate must be well leveled upon foundation and must not be “sprung” by the holding down bolts.

5.3 Coupling alignment must be carefully checked using a steel straight edge and feeler gauges. This should be done in four positions to check levels and concentricity.

5.4 After assembly it must be possible to turn the drive spindle easily by hand.

5.5 Suction and discharge lines must be lined up correctly with the pump casing flanges. The casing must not be distorted by pulling suction and discharge lines into position by means of the flange bolts. Do not forget the gasket.

5.6 The norminal sizes of the suction and delivery lines should, if possible, be such that the flow velocity in the suction line does not exceed 1m/sec and 3m/sec in the delivery line.

5.7 Connected pressure and vaccum gauges.

6. Starting up

6.1 Don’t allow dry running when you start it. Before putting into operation for the first time it should therefore be filled with the fluid to be handled. This will also provide the necessary liquid seal at the screw spindle clearances for priming.

6.2 A connection is provided at the highest point for bleeding the pump(46)

6.3 Check direction of rotation of motor.

6.4 Before starting the pump, open the suction and discharge valves.

6.5 若泵上装有安全阀（当排出管道上有可关闭的阀时，有必要装安全阀）。其开启压力超出工作压力10%，这在出厂实验时已经确定。开启压力可由阀上的调整螺钉调节。

7、泵的拆装

泵必须从驱动端开始拆卸

7.1 将最低位置的螺塞（46）拧开，反转主杆（12）将泵内的存油放尽，然后仍将螺塞拧好。

7.2 拆下泵联轴器。

7.3 自驱动轴上卸下联轴器键（41）。

返回

7.4 松下螺钉（51），用启盖螺钉将转子组件自泵体内取出。

7.5 卸下弹性挡圈（35）。

7.6 a. 松掉螺钉（66），用起盖螺钉将轴承箱（5）连同轴承（34）一同取下，不可与轴磕碰。（660 以下规格）

b. 松掉螺钉（79）、取下压盖（77）、松掉螺钉（54），用启盖螺钉将填料箱（76）取下。（940 以上规格）

7.7 取下机械密封（83）。

7.8 卸下螺钉（55）自衬套上取

6.5 If the pump is equipped with a relief valve, this is set on our test bed to operate at 10% above the working pressure. This is confirmed by the ex-factory test. The start pressure maybe adjusting screw on the valve.

7. Dismantling and Erection

The screw assembly must be removed from the drive end of the pump.

7.1 Screw off the lowest bolt (46) and turn the driving spindle (12) upside down. Let the oil in the pump out. After that tighten the bolt.

7.2 Withdraw pump half coupling by means of extractor gear.

7.3 Remove coupling key from the driving shaft.

7.4 Release cap screw (51) and remove cartridge towards the drive end. (use jacking screw)

7.5 Remove locking rings(35)

7.6 A. Release cap screw (66), remove bearing box (5) and bearing (34) (use jacking screw). Don't knock against shaft.(under size 660).

B. Release cap screw (79), remove the cover (77), release cap screw (54), remove the stuffing box (76) (size up to 940)

7.7 Remove mechanical sealing.

7.8 Release cap screw (55), remove drive end cover (3) from insert.

7.9 At the same time, this will draw with it all three screw spindles and balancing bushes (8), the two idler screws (13) may now be lifted away from the driving spindle (12). Be careful, avoid the idler spindle and balancing sleeve (8) to

返回

下前盖（3）。

7.9 同时从衬套中取下主杆（12），从杆（13），平衡套（8）。从杆（13）、平衡套（8）就可从主杆上取下，但必须小心避免从杆（13）、平衡套（8）掉下磕坏。

7.10 取下弹性挡圈（37），卸掉轴承（34）。

8、机械密封

8.1 由于压差和主杆平衡活塞与前盖间隙的存在，泄漏液体流经球轴承（34）进入腔 D 后通过孔 E 进入吸入腔。孔 E 的设计位置可保证液体润滑机械密封的摩擦表面，并带走磨擦产生的热量。

8.2 启动时应注意密封表面不能干运转。泵水平安装时这点是可以保证的，如立式安装则需在密封腔内注满稀油。

8.3 在安装机械密封时应注意：

a、清理元件时只能用干净布，不可用棉纱头。

b、不可损坏机械密封的密封表面。

be dropped off and to be damaged.

7.10 Remove the locking rings and the bearing.

To re-assemble the spindle unit, proceed in the reverse order. Before assembling the pump, care must be taken that all components are free from dirt and abrasive particles.

8. The Mechanical Sealing

8.1 Because there is the pressure difference and the clearance between the driving spindle balance piston and the front cover, the leakage fluid flows over the ball bearing (34) into the cavity through the hole E into the suction cavity. The design position of hole E may guarantee the liquid to lubricate the friction surface of the mechanical sealing and also the exerting heat is taken out.

8.2 Take care of the sealing. Don't allow dry running when you start it. This can be guaranteed when the pump is horizontal mounted. You must fill full of thin oil into the sealing cavity.

8.3 When fitting the mechanical sealing, the following should be noted:

A. For cleaning the components use only clearages , no cotton waste.
B. Do not damage seal faces.
C. Do not put the rotating surface lies flat.
D. Do not contact the sealing surface with ground.
E. Take care of the installation direction of the dynamic ring.

c、装机械密封时不可损坏 O 型密封圈。

d、不可将密封面触地。

e、应注意动环的安装方向。

注： 1、润滑脂采用钠基润滑脂ZN_2~4 通用锂基润滑ZL_0~2 或M_0S_2 复合钙基润滑脂 1~3。

2、每班注润滑脂一次。

3、泵内机械密封，可以冲洗。

尤其在输送含有颗粒的液体时，为提高泵寿命，冲洗是必要的。冲洗装置，管路由用户自行解决。管路由件 48、49 处接出，并且螺纹为管螺纹。

1. Grease should use sodium base grease ZN2-4 commonly used lithium base grease ZLO-2 and MoSz compound calcium base grease 1-3.

2. Each shift must fill the grease once a time

3. Mechanical sealing in the pump may be washed.

Especially when the pump transports the liquid with pellets. In order to raise the Life-Span, washing is necessary. Washing equipment and pipe should be solved by the user. The pipe should be connected with parts (48,49) and the screw thread is pipe thread

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Note:

9、故障检查表 Trouble List for Checking

Failures in operation								Reason and Remedy	
Pump does not prime	Pump does not vent	Pump operates with reduced output	Pump runs noisily	Motor overheats	Unsteady delivery	Pump seized	Relief valve flutters	Our screw spindle pump always work satisfactorily, if they are fitted correctly into the pipe system and the medium is free from solid contamination and abrasive particles.	
A	B	C	D	E	F	G	H		
—								Check rotation from arrow on pump, if wrong change motor rotation	1
—						—		Check whether pump is filled with fluid	2
—		—	—					Suction line untight. Check suction line and shift packing for tightness	3
—		—	—					Check suction height, if necessary increase pipe diameter, reduce pipe length, fit large filter	4
			—				—	Exchange directly controlled valve against balanced valve	5
—		—						Check whether valve cone is seized, if necessary remove and remachine	6
—	—							Fit air coke on pump delivery side, open coke until air has escaped close coke	7
	—							Non-return valve required in deliver line	8
		—		—				Check speed and current consume of motor, compare volt and freq with motor nameplate.	9
		—			—			Readjust setting screw, if valve spring has taken a remnant replace	10
			—		—			Reduce speed when delivery highly viscous media	11
		—	—					When delivering media with high vapour pressure, medium should flow to the pump	12
		—	—		—			Avoid air in fluid	13
							—	Check over-pressure with closed press valve re-adjust, valve opening press10% above press	14
						—		Check for the filter, if damaged, should take a remanent.	15
						—		If spindles and balancing bush show slight indication of seize, remachine or fit new one.	16
						—		Check if medium has lost lub, for high temp	17
						—		Check if relief bore from stufbox-suction chamber is blocked.	18
		—	—			—		Check whether viscosity of medium agrees with statements on pump nameplate.	19
			—					Check coupling	20

返回

10、附录（轴承、密封、阀）Appendix

Appendix I

Type of working valves

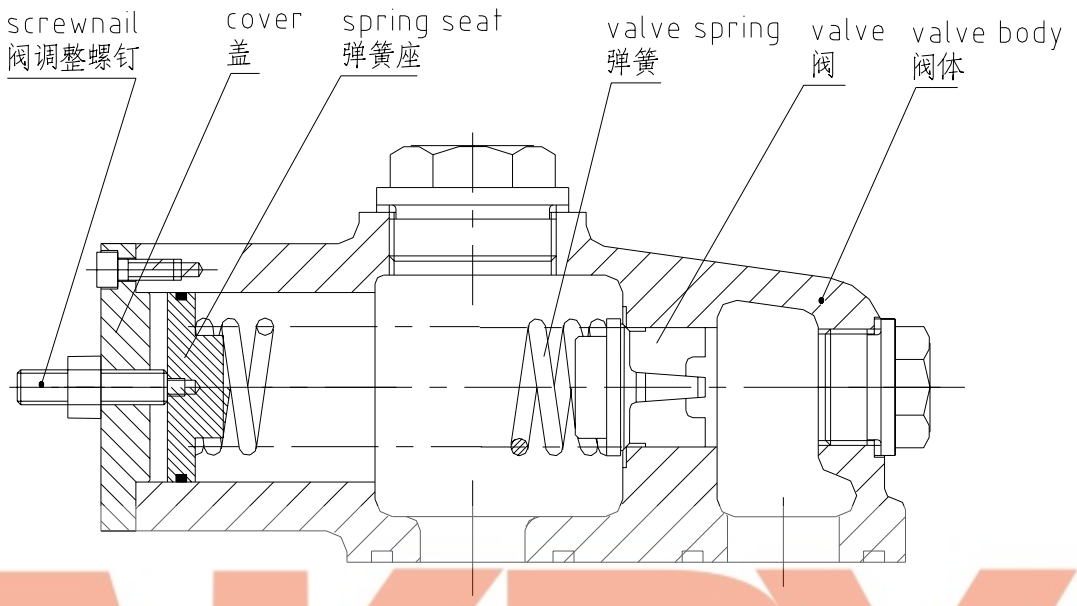
Pump type	Relief valve type	Pressure scope	Remarks
SN.SL 1700	DS50A	0 —— 1.8MP	Direct operated valve
	DV50B	1.8—— 4MP	Polit operated valve
SM 660	DV44B	0 —— 10MP	Polit operated valve

Appendix II

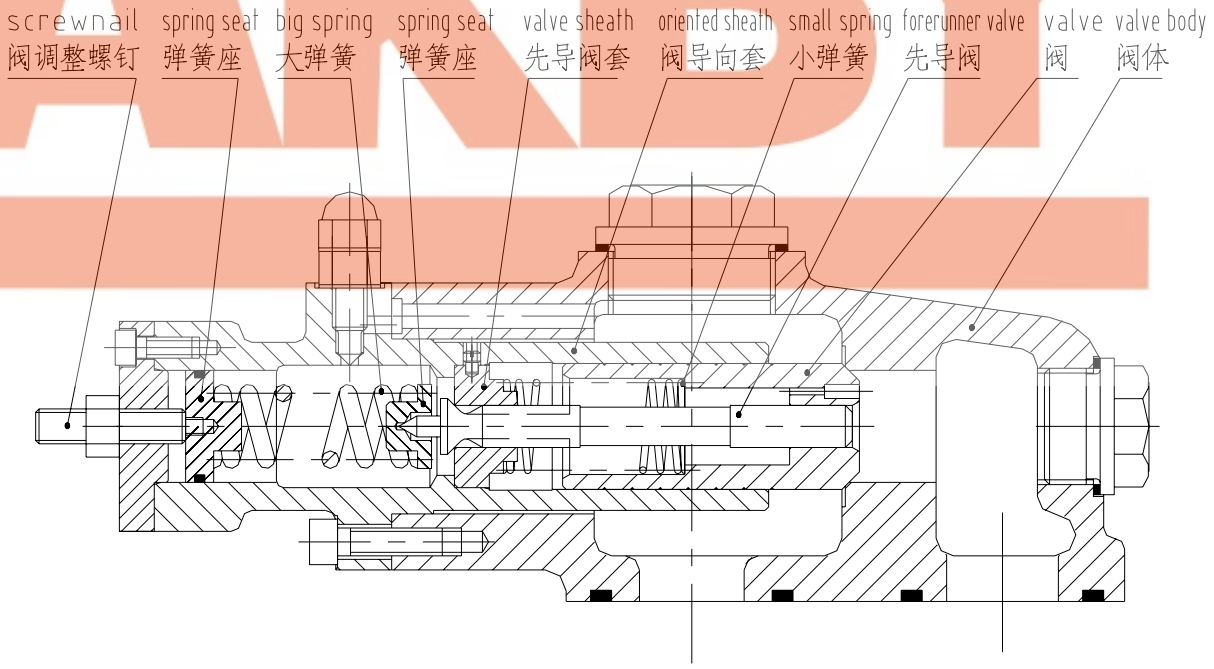
SN、SM、SL Series E6.7 Type

SN	SM	Pump size	Bearing size	Sealing type
H.S.F.E	H.S.F.E		（GB276-82）	(FLEXIBOX)
●	●	660	310	0550
●		1700	312	0650

11 阀结构简图 valve configuration drawing

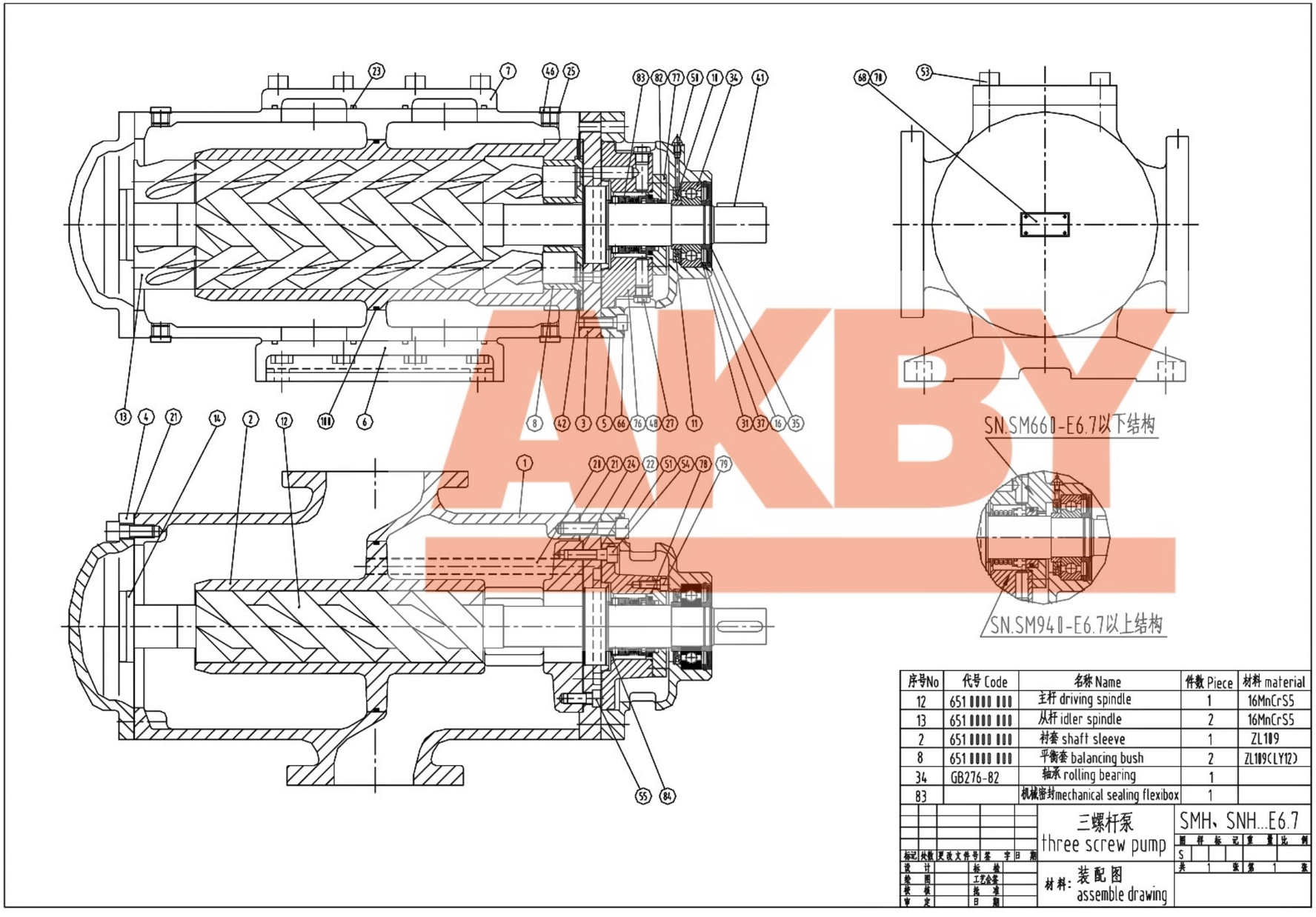


直通式安全阀（straight type safety valve）



先导式安全阀（forerunner type safety valve）

12 泵结构简图 pump configuration drawing



序号No	代号 Code	名称 Name	件数 Piece	材料 material
12	651 ▮▮▮▮ ▮▮▮	主杆 driving spindle	1	16MnCrS5
13	651 ▮▮▮▮ ▮▮▮	从杆 idler spindle	2	16MnCrS5
2	651 ▮▮▮▮ ▮▮▮	衬套 shaft sleeve	1	ZL1▮9
8	651 ▮▮▮▮ ▮▮▮	平衡套 balancing bush	2	ZL1▮9(LY12)
34	GB276-82	轴承 rolling bearing	1	
83		机械密封mechanical sealing flexibox	1	

标记	处数	更改文件号	签字	日期
设计		标准		
绘图		工艺检查		
校核		批准		
审定		日期		

三螺杆泵
three screw pump

材料: 装配图
assemble drawing

SMH、SNH...E6.7

图样标记	重量	比例
S		
共 1 张	第 1 张	

返回